

TITLE: The effect of pack warning labels on quitting and related thoughts and behaviours in a national cohort of Aboriginal and Torres Strait Islander smokers

Corresponding author:

Anna Nicholson GDipPH, BPhy(Hons) PhD^{1,2}

¹ Menzies School of Health Research. PO Box 41096 Casuarina NT 0810

² Centre for Behavioural Research in Cancer, Cancer Council Victoria, 615 St. Kilda Rd, Melbourne, VIC, 3004

E-mail: anna.nicholson@cancervic.org.au

Co-authors:

Ron Borland PhD. Cancer Council Victoria. 615 St Kilda Rd Melbourne, VIC, Australia 3004. E-mail: ron.borland@cancervic.org.au

Pele Bennet BHSc. Natural Talents Sports & Cultural Management. PO Box 8000, Sunnybank, QLD, Australia, 4109. E-mail: natural_talents@bigpond.com

Maureen Davey MB BS FAFPHM. Aboriginal Health Service, Tasmanian Aboriginal Centre, GPO Box 569, Hobart, Tasmania, Australia, 7001. E-mail: maureen.d@tacinc.com.au

Jasmine Sarin BHSci(Indig Hlth). E-mail: j_sarin@live.com

Anke Van der Sterren MPH MA BA. Alcohol, Tobacco & Other Drugs Association of ACT. PO Box 7187, Watson, ACT, Australia, 2602. E-mail: anke@atoda.org.au

Matthew Stevens PhD. Menzies School of Health Research. PO Box 41096 Casuarina NT 0810. E-mail: matthew.stevens@menzies.edu.au

David Thomas MB BS PhD FAFPHM. Menzies School of Health Research. PO Box 41096 Casuarina NT 0810. E-mail: david.thomas@menzies.edu.au

3858 words (plus 261 word abstract, 40 references, 1 figure, 5 tables, 1 supplementary table)

ABSTRACT

Introduction: The high prevalence of smoking among Aboriginal and Torres Strait Islander people in Australia (39%) contributes substantially to health inequalities. This study assesses the impact of warning labels on quitting and related thoughts and behaviours for Aboriginal and Torres Strait Islander smokers.

Methods: Participants were recruited from communities served by 34 Aboriginal Community Controlled Health Services and communities in the Torres Strait, Australia, using quota sampling. A cohort of 642 daily/weekly smokers completed relevant questions at baseline (April 2012-October 2013) and follow up (August 2013-August 2014).

Results: We considered three baseline predictor variables: noticing warning labels, forgoing cigarettes due to warning labels ('forgoing') and perceiving labels to be effective. Forgoing increased significantly between surveys only for those first surveyed prior to the introduction of plain packs (19% vs. 34%), however there were no significant interactions between forgoing cigarettes and the introduction of new and enlarged graphic warning labels on plain packaging in any model. Forgoing cigarettes predicted attempting to quit (AOR: 1.45, 95% CI: 1.02-2.06) and, among those who did not want to quit at baseline, wanting to quit at follow-up (AOR: 3.19, 95% CI: 1.06-9.63). Among those less worried about future health effects, all three variables predicted being very worried at follow-up. Often noticing warning labels predicted correct responses to questions about health effects that had featured on warning labels (AOR: 1.84, 95% CI: 1.20-2.82) but not for those not featured.

Conclusions: Graphic warning labels appear to have a positive impact on the understanding, concerns and motivations of Aboriginal and Torres Strait Islander smokers and, through these, their quit attempts.

IMPLICATIONS: Graphic warning labels are likely to be effective for Aboriginal and Torres Strait Islander smokers as they are for the broader Australian population.

INTRODUCTION

Daily smoking rates decreased from 49% to 39% among Indigenous Australians (Aboriginal and Torres Strait Islander peoples) in the decade to 2014-15.¹ However, after adjusting for differences in age structure, the rate of daily smoking among Aboriginal and Torres Strait Islander peoples remains almost 3 times that for non-Indigenous Australians,² which contributes substantially to inequalities in health outcomes.³

Warning the public about the dangers of smoking is a key tobacco control strategy.⁴ Australia mandated warnings on all cigarette packs in 1973, and these have been progressively strengthened over time. Graphic warning labels have been displayed over 30% of the front and 90% of the back of cigarette and other tobacco packs in Australia since 2006. From December 2012, the Tobacco Plain Packaging Act mandated two new sets of health warnings, which were enlarged to 75% front-of-pack and 90% back-of-pack.^{5,6}

Pack warning labels work in a complementary manner with other anti-tobacco media to improve knowledge about the health effects of smoking and secondhand smoke.⁷⁻⁹ In addition to their impact on knowledge, past research has shown that smokers who read, think about and discuss warning labels are more likely to think about quitting smoking or to forgo cigarettes.^{10,11} These reactions are strongest for warning labels that are large, prominent and graphic.¹¹ Strong reactions to warning labels, such as thinking about quitting or forgoing cigarettes in response to the label, have been shown to predict future attempts to quit in some studies.^{10,12} The pathway from warning labels to quitting appears to occur through by prompting thoughts about the harms of smoking and concern for health, which strengthen intentions to quit.¹³ Further, warning labels may also be a useful tool to combat urges to smoke once quit.¹⁴

Past cross-sectional research has shown that two thirds of Aboriginal and Torres Strait Islander smokers often notice the labels on their cigarette packs, and this does not differ by remoteness, education, or other indicators of advantage.¹⁵ This contrasts with other forms of advertising and information, for which exposure tends to ebb and flow, and are noticed less often by Aboriginal and Torres Strait Islander smokers who live in remote areas.¹⁵ New evidence shows that warning label recall is associated with concern for health and harms of secondhand smoke in this setting, as elsewhere.¹⁵ Further, new and enlarged graphic warning labels on plain packs appear to have reduced misperceptions among Aboriginal and Torres Strait Islander peoples that cigarette brands differ in harm,¹⁶ perhaps through the removal of misleading colours and images. Together these studies suggest Australia's warning labels are likely to be an effective platform to communicate new messages and to motivate quitting for this priority population.

This paper considers the impact of warning labels on quitting and related thoughts and behaviours among Aboriginal and Torres Strait Islander smokers. Specifically, the paper aims to assess whether warning label recall, forgoing cigarettes due to warning labels and believing that warning labels are effective predict quitting and related thoughts and behaviours, including concern for health, wanting to quit, stubbing out cigarettes. The paper

also aims to investigate whether smokers who notice warning labels on their packs are more likely demonstrate knowledge about the health effects of smoking. These results will inform our understanding of what tobacco control strategies will best address the disparity in smoking and related health outcomes between Aboriginal and Torres Strait Islander people and non-Indigenous people in Australia.

METHODS

Survey design and participants

The Talking About the Smokes Project surveyed 1,721 Aboriginal and/or Torres Strait Islander smokers and recent quitters between April 2012 and October 2013 (Wave 1). This paper relates to the 1,549 who smoked at least weekly at the time of the baseline survey, of which 48% (739/1549) completed the recontact survey approximately one year later (median 12 months, IQR 11-15 months), between August 2013 and August 2014 (Wave 2). A number of changes to graphic warning labels and cigarette packaging were implemented in Australia between the two survey waves as part of the Tobacco Plain Packaging Act, including the introduction of new and enlarged warning labels on standardised (plain) packaging (Figure 1). Just over a quarter of the cohort (28%) was first surveyed before changes under the Tobacco Plain Packaging Act took effect, just under a quarter (24%) were surveyed during the phase-in period and the remainder (48%) were surveyed after standardised packaging was mandated.

The research methods, including comparison of our baseline sample with other national surveys, have been reported in detail elsewhere.^{17,18} Briefly, participants were recruited from 34 communities in mainland Australia, in which there was a health service that is owned and managed by Aboriginal and Torres Strait Islander people (known as an Aboriginal Community Controlled Health Service or ACCHS) and from communities in the Torres Strait. Project sites were selected based on the population distribution of Aboriginal and Torres Strait Islander peoples, by State/Territory and remoteness. Quotas were used for even recruitment of men and women, and those aged 18-34 and ≥ 35 years of age, within the quota established for each site (50 smokers or recent quitters for 30/35 Sites, which was doubled for 4 large urban sites and in the Torres Strait). Participants were recruited using methods appropriate to the geographic and social context of the project site. People were excluded if they did not identify as Aboriginal or Torres Strait Islander, were less than 18 years of age, were not usual residents of the area, were staff of the project site (who were surveyed separately), or were unable to provide informed consent. The baseline sample closely matched the sample distribution of the 2008 National Aboriginal and Torres Strait Islander Social Survey (NATSISS) by age, sex, jurisdiction and remoteness, and number of cigarettes per day reported by current daily smokers. However, there were higher proportions of unemployed people, but also higher proportions who had completed Year 12 and who lived in more advantaged areas.

We resurveyed 50% (849/1721) of all eligible participants, or 49% (759/1549) of the daily/weekly smokers. A further twenty chose just to complete a short survey asking if they had made a quit attempt since the last survey and if they were now quit, but have been considered as lost to follow up in the analyses presented here, due to missing data for all but one of the main outcomes. Those who were recontacted were similar to those lost to follow up, except that they were less likely to be from cities and areas of advantage, were also less interested in quitting, and were less likely to have tried to quit in the past year when compared to those lost to follow-up (Supplementary Table 1).

Baseline and recontact surveys were conducted by trained interviewers, almost all of whom were members of the local Aboriginal and Torres Strait Islander community. All baseline and 83% of follow-up surveys were conducted face-to-face, with the remaining follow-up surveys conducted by phone when a face-to-face survey was not possible.

The survey was modelled on the International Tobacco Control (ITC) Policy Evaluation Project, particularly the Australian ITC Project surveys. The Talking About the Smokes survey includes a subset of questions related to warning labels that have been asked in previous ITC surveys, which were limited in number in order to allow for the inclusion of questions on other topics (the scope of which was determined by the Research Team and Project Reference Group).

The project was approved by three Aboriginal human research ethics committees (HRECs) and two HRECs with Aboriginal subcommittees.

Questions related to warning labels

At baseline and follow-up, participants who had smoked in the past month were asked, in the last month: “how often have you noticed warning labels on packs?” (‘recall’: 1. never to 5. very often; dichotomised: often-very often vs. never, rarely or sometimes) and “how often have warning labels stopped you from having a smoke when you were about to have one?” (‘forgoing’: 1. never to 4. many times; dichotomised: once or more often vs. never). All smokers were asked: “How much do you think warning labels make you more likely to quit smoking?” (1. not at all, 2. somewhat, 3. very much), termed ‘perceived effectiveness’.

Quit-related outcomes

Follow-up data was used to derive three outcomes related to quitting: ‘Tried to quit between surveys’, ‘If tried to quit, sustained a quit attempt for one month or longer between surveys’, and ‘Had been quit for one month or longer at follow up’.

Secondary outcome measures

i) Thoughts and behaviours that relate to quitting

Three questions assessed thoughts or behaviours that relate to quitting (‘micro-indicators’) at follow-up: i. “In the last month, have you stubbed out a smoke before you finished it because you thought about the harm of smoking?” (no/yes); ii. “Do you want to quit smoking?”

(no/yes); and iii. “How worried are you that smoking will damage your health in the future?” (1. not at all worried to 4. very worried; dichotomised: very worried vs. less than very worried). Change variables were derived among participants who did not hold the desired position at baseline, by assessing whether or not the thought/behaviour had been adopted at follow up.

ii) *Knowledge about the health effects of smoking*

The follow up survey included nine questions about the health effects of smoking and secondhand smoke. Five of these nine questions related to health effects that have featured on pack warning labels, including in the graphic imagery. Specifically, whether smoking: causes chronic bronchitis and emphysema, causes blindness, causes stroke, causes low birthweight, and damages gums and teeth (yes vs. no or don’t know to each; summarised as a dichotomous outcome ‘All 5 knowledge questions that had featured on warning labels correct’). The remaining four questions had not featured on any pack warnings prior to this study; that smoking: makes diabetes worse, makes it harder to fight infection, causes heart attacks in non-smokers from secondhand smoke, causes ear disease in children from secondhand smoke (yes vs. no or don’t know to each; summarised as a dichotomous outcome ‘All 4 other knowledge questions correct’).

Covariates

Socio-demographic covariates included age (18-24, 25-34, 35-44, 45-54, 55+), sex, remoteness (major city, inner or outer regional, remote or very remote), education, and area-level disadvantage (Socio-Economic Index for Areas) at baseline. Cigarette consumption was assessed using a categorical variable that differentiated non-daily smokers from those who smoked 1-20 cigarettes per day, and those who smoked more than 20 cigarettes per day. We also derived a variable to control for variation in the number of months between the baseline and follow up survey (<11 months, ≥11 months & <12 months, ≥12 months & <14 months, ≥14 months).

All analyses adjust for baseline exposure to the new and enlarged graphic warning labels on plain packaging i.e. whether the survey was completed prior to or following 1 September 2012. However pack warning labels are just one component of Australia’s comprehensive approach to tobacco control. As such, additional adjustments were made for exposure to other sources of health information or the presence other tobacco control policies: frequency of anti-tobacco news recall and advertising recall in the six months prior to follow up (1. never to 5. very often; collapsed: never, rarely-sometimes, often-very often), recall of advice to quit from a health professional prior to follow up (no/yes), and whether the follow up survey occurred before or after the first of four 12.5% increases in excise tax (1st December 2013).

Statistical analysis

All analyses were conducted with Stata 14, using unweighted data (due to non-probability based sampling).

Comparisons of proportions were conducted using McNemar's exact test for repeated (paired) data.

To assess the effectiveness of warning labels, we used logistic regression analyses to determine whether baseline measures of recall, forgoing and perceived effectiveness predicted responses at follow-up for: i) each of the three quit-related outcomes; and ii) changes in micro-indicators (from not holding to holding desired responses, among those who did not hold the desired response at baseline). We also assessed whether warning label recall at baseline predicted correct responses at follow up to questions about health effects that had and had not featured on packs.

To explore possible effect modification by the introduction of the new and enlarged graphic warning labels on plain packaging, the cohort was first stratified according to the timing of the baseline survey (before, during or following these changes). As shown in Figure 1, all follow up surveys occurred after the introduction of plain packs. Differences in reactions to warning labels between the baseline and follow-up surveys were then considered for each group. Wherever the significance of these differences varied between groups, an interaction term was assessed in later logistic regression models. It was planned to stratify the analysis where the interaction term was found to be significant, however this did not occur in any of the models.

All regression analyses adjusted for the covariates listed, including the introduction of the new and enlarged graphic warning labels on plain packaging. Stata's SVY commands were used for all logistic regression analyses, in order to establish the 35 project sites as clusters and adjust the standard error accordingly for all odds ratios.¹⁹

The sample was restricted to cigarette smokers who smoked at least weekly and had smoked in the month prior to recruitment (baseline). Data from the first (quasi-pilot) site were also excluded (n=4), as these participants were not asked about warning label recall at baseline. 'Don't know' responses were combined with 'no' responses when predicting knowledge. Similarly, the large number of 'don't know' responses (Wave 1: n=27, Wave 2: n=23) for wanting to quit have been combined with 'no' responses when describing trends between waves in the cohort, in order to retain sample size. Elsewhere, the smaller numbers of refused and don't know responses were treated as missing data, which excluded less than 2% of participants from analyses.

RESULTS

Participants

At follow-up, most of the cohort (85%, $n=548$) continued to smoke daily or weekly; 14 (2%) smoked less than weekly, 20 (3%) had quit within the past month, and 60 (9%) were ex-smokers quit for one month or more (Table 1). There was a significantly greater proportion of the cohort who had often noticed warning labels on their packs at baseline than at follow-up (66% vs. 61%, $p=0.01$).

When the cohort was stratified by baseline exposure to the new and enlarged graphic warning labels on plain packaging, there was a significant increase in forgoing cigarettes due to warning labels between survey waves for those who were surveyed before plain packs were introduced (17% vs 34%, $p=0.002$), but not for those surveyed subsequent to their introduction (Table 2). There were no other significant changes to warning label reactions between baseline and follow-up when stratified by baseline exposure to the new and enlarged graphic warning labels on plain packaging. Therefore, interactions between forgoing cigarettes and plain packs were considered for models for forgoing cigarettes only. The interaction term was not significant in any of the models.

Predictors of quitting and sustaining quit attempts

Of the three warning label measures collected at baseline, only forgoing cigarettes due to warning labels was significantly associated with attempting to quit between surveys (Table 3).

None of the three warning label measures were associated with success among those who tried, but those who often noticed labels were less likely to have quit for a month or more by follow up than those who never or sometimes noticed the warning labels on their packs.

Changes to thoughts and intentions related to quitting

We next investigated whether baseline recall and reactions to health warning labels was predictive of changes in smoking-related attitudes (Table 4). Among smokers who were not very worried about future health consequences of smoking at baseline, all three warning label measures predicted the desired response (being very worried about health) at follow up. Among those who did not want to quit at baseline, only those who had forgone cigarettes due to warning labels were more likely to want to quit at follow up. Among those who had not stubbed out cigarettes due to thoughts about harm at baseline, none of the three predictors were associated with commencing this behaviour by follow up.

Warning label recall and knowledge about health effects of smoking

Compared to those who never or only sometimes noticed the warning labels on their packs at baseline, those who often noticed their pack warning labels were significantly more likely to provide correct responses to all questions on health effects of smoking that had featured on

pack warning labels. However, noticing warning labels did not predict correct responses to questions on health effects that had *not* been featured on pack warning labels (Table 5).

CONCLUSIONS

These results show that pack warning labels have a positive impact on Aboriginal and Torres Strait Islander smokers, supporting current Australian packaging regulations. We found pack warning labels contributed to knowledge about the harmful effects of smoking, and generated reactions that have been shown to be determinants of quitting activity elsewhere.^{10,12} In particular, our results show that other responses to warning labels, such as forgoing cigarettes due to warning labels, were associated with increased quitting activity as well as increased concerns about smoking. These findings are largely consistent with a mediational model proposed for how warning labels influence quitting among the general population.¹³

Our ability to examine the effectiveness of the new and enlarged graphic warning labels on plain packaging was limited, as everyone in the cohort was exposed to these packs by follow up. However, the significant increase in forgoing cigarettes among those first surveyed before these changes (that was not observed for others) suggests that they have had a positive impact on Aboriginal and Torres Strait Islander smokers. Elsewhere, national studies have reported changes in other micro-indicators of quitting (but not forgoing cigarettes) following of the new and enlarged graphic warning labels on plain packaging.^{20,21} The increase in forgoing cigarettes apparent here is particularly important given the positive association between forgoing cigarettes and subsequent attempts to quit. This is consistent with findings from other population-based studies, in which forgoing cigarettes has been shown to be a predictor of increased quitting in most^{5,10,12,22} but not all studies.¹³

Our results demonstrate that warning labels provide new information to Aboriginal and Torres Strait Islander smokers about the health effects of smoking, as they do for other populations.^{7,8,11,23} Although Aboriginal and Torres Strait Islander peoples are knowledgeable about the most harmful effects of smoking, particularly related to lung cancer, other illnesses are less well known.^{15,24,25} The Australian system of rotating warning labels aims to maintain attention towards these labels and to maximise the number of health effects that can be communicated.^{26,27} Given pack warning labels are seen each time a smoker lights up, they are an opportunistic platform to deliver health information.^{28,29} Specific knowledge-gaps, particularly for health effects shown to be powerful and motivating to Aboriginal and Torres Strait Islander smokers, could be targeted in future health warning labels.

In these findings, Australia's large and graphic warning labels contributed to awareness of the health risks of smoking for respondents who had not completed Year 12 education as well as those with higher levels of education. Although there is no strong or conclusive evidence that health warning labels have a positive impact on health equity, large and graphic pack warning labels are an invaluable tool for communicating health information to populations with low literacy rates.^{29,30} However, health warnings on packs are only one source of information

about the harmful effects of smoking; elsewhere we have shown important effects of mass media campaigns,¹⁵ consistent with the international literature.³¹

Although knowledge and worry about future health consequences are important outcomes that may motivate quitting, other factors are likely to be important for influencing the success of these quit attempts.^{32,33} Compared to daily smokers in the general Australian population, Aboriginal and Torres Strait Islander smokers are equally likely to make a quit attempt but less likely to sustain a quit attempt for a month or more.³⁴ More of our focus needs to be directed to supporting Aboriginal and Torres Strait Islander peoples to stay quit, once they have stopped. Decisions to smoke or quit smoking are influenced by factors that extend beyond rational thoughts about harms to health and health of others, such as the context in which smoking and quitting occurs.^{35,36} It is therefore important that communication about the harms of smoking co-exists with efforts that address the social and economic influences of smoking.

Strengths and limitations

The design of this study is based on a conceptual model established and tested by the International Tobacco Control (ITC) policy evaluation project,³⁷ which has contributed substantially to what we know about the effectiveness of warning labels to influence quitting.²⁹ The use of cohort design acts as a type of natural experiment, in which we can track changes to knowledge, thoughts and behaviours that often precede quitting. While there were challenges associated with recontacting participants, the strength of the cohort design lies in each participant acting as their own comparison, in order to assess change over time. The ITC conceptual model also measures and takes into account the effects of concurrent policies and programs, thus improving the internal validity of the study.³⁸

We had planned for an attrition rate of 50%, given reported attrition rates of Aboriginal and Torres Strait Islander participants of up to 35-44% in some studies with follow up at one year.^{39,40} The loss to follow up of 52%, combined with a smaller sample size than planned (1,643 of 2,000) resulted in reduced power to detect a statistically significant difference where present, particularly when analysing sub-samples, such as those who did not want to quit at baseline.

While there were some socio-demographic differences between those recontacted and those lost to follow up, particularly according to remoteness, we have adjusted for these factors in all analyses. It is worth noting that those followed up were less likely to want to quit and had made fewer quit attempts at baseline compared with those who we were unable to recontact, which may limit our ability to generalise these results to Aboriginal and Torres Strait Islander smokers who are more interested in quitting. That these positive effects were found among smokers who could be considered particularly hard to reach is encouraging.

It is possible that responses to some survey questions were affected by social desirability biases, particularly for questions that assess knowledge about the health effects of smoking. We note that knowledge might be better assessed through the use of an open-ended question; however the questions asked allowed the interviewer to probe knowledge of health

effects that were of particular interest and relevance to Aboriginal and Torres Strait Islander people.

In conclusion, the evidence suggests graphic warning labels have a positive impact on the understanding, concerns and motivations of Aboriginal and Torres Strait Islander smokers and, through these, their quit attempts. In particular, the introduction of plain (standardised) packaging and the accompanying larger graphic warnings appear to have had a positive impact. Warning labels are one of many measures that will be useful to continue to communicate the harms of smoking and encourage quitting. A comprehensive approach to tobacco control will be required to support Aboriginal and Torres Strait Islander smokers to quit and sustain their quit attempts.

FUNDING

The project was funded by the Australian Government Department of Health. Matthew Stevens is supported by a National Health and Medical Research Council (NHMRC) fellowship, and Anna Nicholson was supported by an NHMRC post-graduate scholarship and a Sidney Myer Health Scholarship. The views expressed in this publication are those of the authors and do not reflect the views of funding bodies.

COMPETING INTERESTS

None declared.

ACKNOWLEDGMENTS

We acknowledge that Viki Briggs, Sophie Couzos, Jenny Hunt, Katie Panaretto, Raylene Foster, Sharon Bushby, Chris Halacas, Nadia Lusi, Chanel Web, Mary-Anne Williams and past members of the Project Reference Group contributed to research design, interpretation of results, or review of the manuscript. We acknowledge and thank the participants, staff and management at participating Aboriginal Community Controlled Health Services, the Torres Shire Council, and project staff.

We have listed 8 authors, all of whom contributed to the research design, interpretation of results, and preparation of the manuscript, consistent with the collaborative nature of the Talking About the Smokes study.

REFERENCES

1. Australian Bureau of Statistics. *Australian Aboriginal and Torres Strait Islander Health Survey: Updated Results, 2012–13*. Canberra, Australian Capital Territory: Australian Bureau of Statistics; 2014.
2. Australian Bureau of Statistics. *National Aboriginal and Torres Strait Islander Social Survey, 2014-15* Canberra, Australian Capital Territory: Australian Bureau of Statistics; 2016.
3. Vos T, Barker B, Stanley L, et al. *The Burden of Disease and Injury in Aboriginal and Torres Strait Islander Peoples 2003. Policy Brief*. Brisbane: School of Population Health. University of Queensland.;2007. Available from:
4. World Health Organisation. *Who Framework Convention on Tobacco Control*. Vol 2012: WHO; 2003.
5. Borland R. Tobacco Health Warnings and Smoking-Related Cognitions and Behaviours. *Addiction*. 1997;92(11):1427-1435.
6. Scollo M, Lindorff K, Coomber K, et al. Standardised Packaging and New Enlarged Graphic Health Warnings for Tobacco Products in Australia—Legislative Requirements and Implementation of the Tobacco Plain Packaging Act 2011 and the Competition and Consumer (Tobacco) Information Standard, 2011. *Tob Control*. 2015;24(Suppl 2):ii9-ii16.
7. Miller CL, Quester PG, Hill DJ, et al. Smokers' Recall of Australian Graphic Cigarette Packet Warnings & Awareness of Associated Health Effects, 2005-2008. *BMC Public Health*. 2011;11:238-238.
8. Kennedy RD, Spafford MM, Behm I, et al. Positive Impact of Australian 'Blindness' Tobacco Warning Labels: Findings from the Itc Four Country Survey. *Clin Exp Optom*. 2012;95(6):590–598.
9. Brennan E, Durkin SJ, Cotter T, et al. Mass Media Campaigns Designed to Support New Pictorial Health Warnings on Cigarette Packets: Evidence of a Complementary Relationship. *Tob Control*. 2011;20(6):412-418.
10. Borland R, Yong HH, Wilson N, et al. How Reactions to Cigarette Packet Health Warnings Influence Quitting: Findings from the Itc Four-Country Survey. *Addiction*. 2009;104(4):669-675.
11. Hammond D. Health Warning Messages on Tobacco Products: A Review. *Tob Control*. 2011;20(5):327-337.
12. Partos TR, Borland R, Thrasher JF, et al. The Predictive Utility of Micro Indicators of Concern About Smoking: Findings from the International Tobacco Control Four Country Study. *Addict Behav*. 2014;39(8):1235-1242.
13. Yong H-H, Borland R, Thrasher JF, et al. Mediation Pathways of the Impact of Cigarette Warning Labels on Quit Attempts. *Health Psychol*. 2014;33(11):1410-1420.
14. Partos TR, Borland R, Yong HH, et al. Cigarette Packet Warning Labels Can Prevent Relapse: Findings from the International Tobacco Control 4-Country Policy Evaluation Cohort Study. *Tob Control*. 2013;22(e1):e43-e50.
15. Nicholson AK, Borland R, Sarin J, et al. Recall of Anti-Tobacco Advertising and Information, Warning Labels and News Stories in a National Sample of Aboriginal and Torres Strait Islander Smokers. *Med J Aust*. 2015;202(10):S67-72.
16. Maddox R, Durkin S, Lovett R. Plain Packaging Implementation: Perceptions of Risk and Prestige of Cigarette Brands among Aboriginal and Torres Strait Islander People. *Aust N Z J Public Health*. 2015.
17. Glover M, Kira A, Johnston V, et al. Australian and New Zealand Indigenous Mothers' Report Respect for Smoking Bans in Homes. *Women Birth*. 2015;28(1):1-7.
18. Couzos S, Nicholson AK, Hunt JM, et al. Talking About the Smokes: A Large-Scale, Community-Based Participatory Research Project. *Med J Aust*. 2015;202(10):S13-19.
19. StataCorp. *Stata Survey Data Reference Manual: Release 13*. College Station, Texas, USA.: StataCorp L.P.; 2013.
20. Yong H-H, Borland R, Hammond D, et al. Smokers' Reactions to the New Larger Health Warning Labels on Plain Cigarette Packs in Australia: Findings from the Itc Australia Project. *Tob Control*. 2015.

21. Durkin S, Brennan E, Coomber K, et al. Short-Term Changes in Quitting-Related Cognitions and Behaviours after the Implementation of Plain Packaging with Larger Health Warnings: Findings from a National Cohort Study with Australian Adult Smokers. *Tob Control*. 2015;24(Suppl 2):ii26-ii32.
22. Li L, Fathelrahman AI, Borland R, et al. Impact of Graphic Pack Warnings on Adult Smokers' Quitting Activities: Findings from the ITC Southeast Asia Survey (2005–2014). *J Smok Cessat*. 2016;11(02):124-134.
23. Hammond D, Fong GT, McNeill A, et al. Effectiveness of Cigarette Warning Labels in Informing Smokers About the Risks of Smoking: Findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control*. 2006;15 Suppl 3:iii19-iii25.
24. Lindorff KJ. *Tobacco: Time for Action. National Aboriginal and Torres Strait Islander Tobacco Control Project. Final Report*. Canberra: National Aboriginal Community Controlled Health Organisation;2002. Available from:
25. Maksimovic L, Shen D, Bandick M, et al. Evaluation of the Pilot Phase of the 'Give up Smokes for Good' Social Marketing Campaign. *Health Promot J Austr*. 2015;26(1):16-23.
26. Hitchman SC, Driezen P, Logel C, et al. Changes in Effectiveness of Cigarette Health Warnings over Time in Canada and the United States, 2002-2011. *Nicotine Tob Res*. 2014;16(5):536-543.
27. Li L, Borland R, Yong H, et al. Longer Term Impact of Cigarette Package Warnings in Australia Compared with the United Kingdom and Canada. *Health Educ Res*. 2015;30(1):67-80.
28. Borland R. *Understanding Hard to Maintain Behaviour Change: A Dual Process Approach*. UK: John Wiley & Sons, Ltd.; 2014.
29. Hammond D, Wakefield M, Durkin S, et al. Tobacco Packaging and Mass Media Campaigns: Research Needs for Articles 11 and 12 of the WHO Framework Convention on Tobacco Control. *Nicotine Tob Res*. 2013;15(4):817-831.
30. Hill S, Amos A, Clifford D, et al. Impact of Tobacco Control Interventions on Socioeconomic Inequalities in Smoking: Review of the Evidence. *Tob Control*. 2014;23(e2):e89-e97.
31. Durkin S, Brennan E, Wakefield M. Mass Media Campaigns to Promote Smoking Cessation among Adults: An Integrative Review. *Tob Control*. 2012;21(2):127-138.
32. Nicholson AK, Borland R, Couzos S, et al. Smoking-Related Knowledge and Health Risk Beliefs in a National Sample of Aboriginal and Torres Strait Islander People. *Med J Aust*. 2015;202(10):S45-50.
33. Borland R, Yong H-H, Balmford J, et al. Motivational Factors Predict Quit Attempts but Not Maintenance of Smoking Cessation: Findings from the International Tobacco Control Four Country Project. *Nicotine Tob Res*. 2010;12 Suppl:S4-S11.
34. Nicholson AK, Borland R, Davey ME, et al. Past Quit Attempts in a National Sample of Aboriginal and Torres Strait Islander Smokers. *Med J Aust*. 2015;202(10):S20-25.
35. Song AV, Brown P, Glantz SA. When Health Policy and Empirical Evidence Collide: The Case of Cigarette Package Warning Labels and Economic Consumer Surplus. *Am J Public Health*. 2014;104(2):e42-e51.
36. Slovic P. Cigarette Smokers: Rational Actors or Rational Fools? In: Slovic P, ed. *Smoking: Risk, Perception & Policy*. California: Sage Publications; 2001:97-124.
37. Fong GT, Cummings KM, Borland R, et al. The Conceptual Framework of the International Tobacco Control (ITC) Policy Evaluation Project. *Tob Control*. 2006;15(Suppl III):iii3-iii11.
38. International Agency for Research on Cancer WHO. *IARC Handbooks of Cancer Prevention, Tobacco Control, Vol. 12: Methods for Evaluating Tobacco Control Policies*. Lyon: International Agency for Research on Cancer; 2008.
39. Gilchrist D, Woods B, Binns CW, et al. Aboriginal Mothers, Breastfeeding and Smoking. *Aust N Z J Public Health*. 2004;28(2):225-228.
40. Lehmann D, Stanley FJ, Arumugaswamy A, et al. The Kalgoorlie Otitis Media Research Project: Rationale, Methods, Population Characteristics and Ethical Considerations. *Paediatr Perinat Ep*. 2008;22(1):60-71.

Table 1. Comparison of variables of interest in the cohort at baseline and follow up

	Cohort at baseline	Cohort at follow up	<i>p</i> value
<i>All in cohort</i>	<i>n=642</i>	<i>n=642</i>	
Currently smoke	100%	88%	<i>p<0.001</i>
Tried to quit in the past 12 months/between surveys	45%	51%	<i>p=0.02</i>
Very worried that smoking will damage your health in future (yes vs. not at all-moderately)	35%	38%	<i>p=0.37</i>
Perceive warning labels effective to quit or stay quit (somewhat-very much vs. not at all)	50%	54%	<i>p=0.10</i>
<i>If smoked in the past month (baseline and follow-up)</i>	<i>n=582</i>	<i>n=582</i>	<i>p</i> value
Warning labels noticed often in the past month (recall)	66%	61%	<i>p=0.01</i>
Stopped smoking due to warning labels in the past month (forgoing)	30%	36%	<i>p=0.02</i>
Stubbed out a cigarette due to thoughts about harm (yes vs. no)	30%	33%	<i>p=0.14</i>
<i>If currently smokes (baseline and follow-up)</i>	<i>n=562</i>	<i>n=562</i>	<i>p</i> value
Want to quit (yes vs. no or don't know)	62%	63%	<i>p=0.94</i>

Note: The sample is restricted to those who were asked the question at both time points. Difference assessed using McNemar's exact test for repeated (paired) data. .

Table 2. Reactions to warning labels at baseline compared with follow-up, stratified by the timing of the baseline survey.

	Timing of Baseline Survey (Wave 1)		
	Prior to plain packs	During phase-in of plain packs	After plain packs mandated
<i>If smoke at follow-up</i>	<i>n=171</i>	<i>n=138</i>	<i>n=273</i>
Warning labels noticed often in the past month (recall)			
Baseline (Wave 1)	<i>p=0.15</i> 65%	<i>p=0.42</i> 59%	<i>p=0.11</i> 70%
Follow-up (Wave 2)	58%	56%	64%
Stopped smoking due to warning labels in the past month (forgoing)			
Baseline (Wave 1)	<i>p=0.002</i> 19%	<i>p=0.78</i> 34%	<i>p=0.66</i> 35%
Follow-up (Wave 2)	34%	37%	36%
<i>If smoked in the past month at follow-up</i>	<i>n=180</i>	<i>n=152</i>	<i>n=310</i>
Perceive warning labels effective to quit or stay quit (somewhat-very much vs. not at all)			
Baseline (Wave 1)	<i>p=0.54</i> 46%	<i>p=0.24</i> 49%	<i>p=0.35</i> 52%
Follow-up (Wave 2)	49%	56%	56%

Note: Level of significance reported using McNemar's exact test for repeated (paired) data at Wave 1 (baseline) and Wave 2 (follow-up).

Table 3. Association between baseline reactions to warning labels (predictor variables) and attempts to quit

	Attempted to quit between surveys ¹		Quit for ≥1 month, of those who tried to quit ²		Quit for ≥1 month at follow up (all) ¹	
	freq. (%)	AOR (95% CI)	freq. (%)	AOR (95% CI)	freq. (%)	AOR (95% CI)
How often warning labels noticed		<i>p=1.00</i>		<i>p=0.48</i>		<i>p=0.005</i>
Never-sometimes	105 (47%)	1.0 (ref)	39 (39%)	1.0 (ref)	28 (12%)	1.0 (ref)
Often-very often	222 (54%)	1.00 (0.66-1.52)	73 (34%)	0.80 (0.43-1.50)	32 (8%)	0.44 (0.25-0.77)
Stopped smoking when about to due to warning labels (forgoing)		<i>p=0.04</i>		<i>p=0.99</i>		<i>p=0.79</i>
Never or never noticed	212 (48%)	1.0 (ref)	72 (36%)	1.0 (ref)	38 (9%)	1.0 (ref)
Once to many times	116 (59%)	1.45 (1.02-2.06)	40 (35%)	1.00 (0.57-1.77)	22 (11%)	1.11 (0.52-2.35)
How much do you think warning labels make you more likely to quit smoking?		<i>p=0.46</i>		<i>p=0.23</i>		<i>p=0.12</i>
Not at all	146 (46%)	1.0 (ref)	48 (35%)	1.0 (ref)	26 (8%)	1.0 (ref)
Somewhat	130 (53%)	1.12 (0.73-1.74)	42 (33%)	1.01 (0.54-1.89)	22 (9%)	0.85 (0.40-1.79)
Very much	45 (65%)	1.77 (0.72-4.38)	20 (45%)	2.10 (0.82-5.39)	10 (14%)	1.82 (0.60-5.47)

¹ Results are for recontacted daily/weekly smokers in the Talking About the Smokes study (n=642), ² or n=329 where restricted to those who tried to quit between surveys. Adjusted odds ratios (AOR) control for the interval between surveys, socio-demographics (age, sex, remoteness, education and SEIFA), cigarettes per day (non-daily/1-19, 20+) , plain packaging and other policy-relevant variables (recall of advertising, recall of news stories, advice to quit smoking, tax rise). Level of significance (p-value) reported for the entire variable using Adjusted Wald tests

Table 4. Association between baseline measures related to warning labels (predictor variables) and changes in thoughts and behaviours related to quitting

	Very worried about future health effects at follow up, if not very worried at baseline (n=413)		Wants to quit at follow up, if did not want to quit at baseline (n=189)		Stubbed out cigarette/s due to thoughts about harm at follow up, if had not stubbed out cigarettes at baseline (n=408)	
	<i>freq. (%)</i>	<i>AOR (95% CI)</i>	<i>freq. (%)</i>	<i>AOR (95% CI)</i>	<i>freq. (%)</i>	<i>AOR (95% CI)</i>
How often warning labels noticed		<i>p=0.02</i>		<i>p=0.62</i>		<i>p=0.66</i>
Never-sometimes	37 (20%)	1.0 (ref)	33 (36%)	1.0 (ref)	31 (20%)	1.0 (ref)
Often-very often	76 (34%)	1.95 (1.10-3.43)	44 (46%)	1.25 (0.50-3.08)	70 (29%)	1.14 (0.62-2.08)
Stopped smoking when about to due to warning labels (forgoing)		<i>p=0.0013</i>		<i>p=0.04</i>		<i>p=0.25</i>
Never or never noticed	69 (23%)	1.0 (ref)	63 (39%)	1.0 (ref)	75 (24%)	1.0 (ref)
Once to many times	44 (42%)	2.56 (1.49-4.41)	15 (56%)	3.19 (1.06-9.63)	26 (33%)	1.44 (0.76-2.75)
How much do you think warning labels make you more likely to quit smoking?		<i>p=0.003</i>		<i>p=0.10</i>		<i>p=0.09</i>
Not at all	57 (23%)	1.0 (ref)	50 (36%)	1.0 (ref)	49 (21%)	1.0 (ref)
Somewhat	43 (31%)	1.60 (0.89-2.87)	24 (53%)	2.97 (1.07-8.21)	40 (31%)	1.90 (1.09-3.33)
Very much	13 (65%)	5.31 (2.15-13.10)	2 (67%)	2.94 (0.29-30.31)	10 (36%)	1.54 (0.57-4.16)

Results are for recontacted daily/weekly smokers in the Talking About the Smokes study, who did not hold these beliefs at baseline and provided a response at follow up. Adjusted odds ratios (AOR) control for the interval between surveys, socio-demographics (age, sex, remoteness, education and SEIFA), cigarettes per day (non-daily/1-19, 20+) , plain packaging and other policy-relevant variables (recall of advertising, recall of news stories, advice to quit smoking, tax rise). Level of significance (p-value) reported for the entire variable using Adjusted Wald tests. .

Table 5.. Association between recall of warning labels at baseline and knowledge about the health effects of smoking, by whether these health effects had featured on warning labels

	All 5 knowledge questions that had featured on past warning labels correct		All 4 other knowledge questions (that had not featured on warning labels) correct	
	<i>freq. (%)</i>	<i>Adj. OR (95% CI)</i>	<i>freq. (%)</i>	<i>Adj. OR (95% CI)</i>
How often warning labels noticed		<i>p=0.006</i>		<i>p=0.87</i>
Never-sometimes	130 (58%)	1.0 (ref)	112 (50%)	1.0 (ref)
Often-very often	302 (73%)	1.84 (1.20-2.82)	217 (53%)	1.03 (0.73-1.45)

Results are for recontacted daily/weekly smokers in the Talking About the Smokes study, who did not hold these beliefs at baseline and provided a response at follow up. Adjusted odds ratios (AOR) control for the interval between surveys, socio-demographics (age, sex, remoteness, education and SEIFA), cigarettes per day (non-daily/1-19, 20+) , plain packaging and other policy-relevant variables (recall of advertising, recall of news stories, advice to quit smoking, tax rise). Level of significance (p-value) reported for the entire variable using Adjusted Wald tests

[illegible]